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STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

INVENTORY AND CATALOGING OF SPORT FISH AND SPORT FISH WATERS OF WESTERN ALASKA

by

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RESEARCH PROJECT SEGMENT

State:	Alaska	Name:	Sport Fish Investigations of Alaska
Project No.:	F-9-12		
Study No.:	G-I	Study Title:	INVENTORY AND CATALOGING
Job No.:	G-I-P	Job Title:	Inventory and Cataloging of Sport Fish and Sport Fish Waters of Western Alaska
Job Duration:	July 1, 1979 to June 30, 1980		

ABSTRACT

Five streams in the lower Yukon River between Nulato and Holy Cross were surveyed in 1979 to collect baseline information on the streams and their fish. The Nulato and Anvik rivers are swift moving through most of their course and contain Arctic char, Salvelinus alpinus (Linnaeus), and large salmon, Oncorhynchus sp., runs. The Khotol, Bonasila, and Innoko are slower moving streams with whitefish, Coregonus sp., sheefish, Stenodus leucichthys (Güldenstadt), and pike, Esox lucius Linnaeus, being important species. Extensive sampling on the lower 100 miles of the Anvik River revealed large numbers of Arctic grayling, Thymallus arcticus (Pallas), and Arctic char. Some pike and whitefish were present in sloughs of the upper Anvik, and sampling in the lower 100 miles of the Innoko River took sheefish in the main river and pike and whitefish in lake and slough areas. Sheefish were feeding heavily on a downstream migration of various whitefish species. Sport fishing pressure on streams surveyed is light, with grayling, Arctic char, and pike the target species.

Biological data were analyzed from the major species encountered. Age and growth studies indicated growth similar to or slower than that of the same species from the Kuskokwim River and streams of interior Alaska. Gill raker and pyloric caeca counts of char placed them in the Arctic char group rather than Dolly Varden, Salvelinus malma (Walbaum), which occur futher up the Yukon River system as a dwarf form.

The Pilgrim River was surveyed from Salmon Lake to Imuruk Basin. The five species of salmon were the most abundant group of fish, but grayling, pike, Arctic char, and broad whitefish, C. nasus (Pallas), are also present. Northern pike were distributed mainly in the lower river while the salmon, grayling, and Arctic char were most abundant in the middle reaches of the Pilgrim River from the bridge downstream to Pilgrim Hot Springs. Grayling, Arctic char, and pike are the most important sport species. Despite heightened interest in the trophy size grayling in the Pilgrim River and the low population density, there is no indication that the grayling population has decreased in number from 1977 to 1979.

RECOMMENDATIONS

It is recommended:

1. That a physical-biological study of the Fish-Niukluk rivers be initiated.

2. That the lower Melozitna River be surveyed with emphasis on Arctic char.

3. That surveys of index spawning streams in the Wulik-Kivalina rivers be conducted in 1980.

4. That spot checks of important waters of the Seward Peninsula and other important sport fish waters be made as time permits to remain aware of patterns in usage.

OBJECTIVES

1. To complete a physical-biological survey of the Pilgrim River.

2. To conduct basic stream survies of rivers tributary to the lower and middle Yukon River, with emphasis on the Anvik and Andreafsky rivers.

3. To collect angler and subsistence use information on important sport fish species in waters of the job area.

BACKGROUND

The waters of the lower Yukon River, i.e. Anvik, Nulato, and Andreafsky Rivers have long been known for their good runs of salmon, especially chum salmon, O. keta (Walbaum), Table 1. The Anvik and Andreafsky Rivers were known to contain char (Salvelinus sp.). The Division of Commercial Fisheries, Alaska Department of Fish and Game, has conducted aerial surveys and counts of migrating salmon, but there has been little work done on other species or their habitat in the area from Nulato to the Yukon River mouth. The survey emphasis of the present study was on larger streams and those streams containing char. The Anvik, Nulato, Khotol, Bonasila, and lower Innoko Rivers were surveyed in 1979, the Andreafsky River will be surveyed before the salmon migration in 1980 and the remainder of the Innoko River will be surveyed in 1981 and 1982.

The Pilgrim River study is a continuation of the investigation of waters and sport fisheries resources in the Seward Peninsula area. The Pilgrim River was chosen because it is in the Nome area road system, and because of interest in fishing by local residents for trophy size grayling. We had documented the presence of 3-pound grayling in this stream during preliminary investigations in 1977. Fishing pressure was increasing and there was local concern that, with the liberal bag limit (15 grayling daily, no more than three over 20 inches) the grayling population could easily be decimated. Estimates of number of grayling per mile in areas of prime

Table 1. List of common names, scientific names and abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Arctic char	Salvelinus alpinus (Walbaum)	AC
Bering cisco	Coregonus laurettae Bean	BCI
Blackfish	Dallia pectoralis Bean	BF
Broad whitefish	Coregonus nasus (Pallas)	HWF
Burbot	Lota lota (Linnaeus)	BB
Chinook salmon	Oncorhynchus tshawytscha (Walbaum)	KS
Coho salmon	Oncorhynchus kisutch (Walbaum)	SS
Chum salmon	Oncorhynchus keta (Walbaum)	CS
Grayling	Thymallus arcticus (Pallas)	GR
Humpback whitefish	Coregonus pidschian (Gmelin)	HWF
Least cisco	Coregonus sardinella Valenciennes	LCI
Longnose sucker	Catostomus catostomus (Forster)	LNS
Northern pike	Esox lucius Linnaeus	NP
Pink salmon	Oncorhynchus gorbuscha (Walbaum)	PS
Red salmon	Oncorhynchus nerka (Walbaum)	RS
Round whitefish	Prosopium cylindraceum (Pallas)	RWF
Sheefish	Stenodus leucichthys (Güldenstadt)	SF
Slimy sculpin	Cottus cognatus Richardson	SSc
Trout perch	Percopsis omiscomaycus (Walbaum)	TP

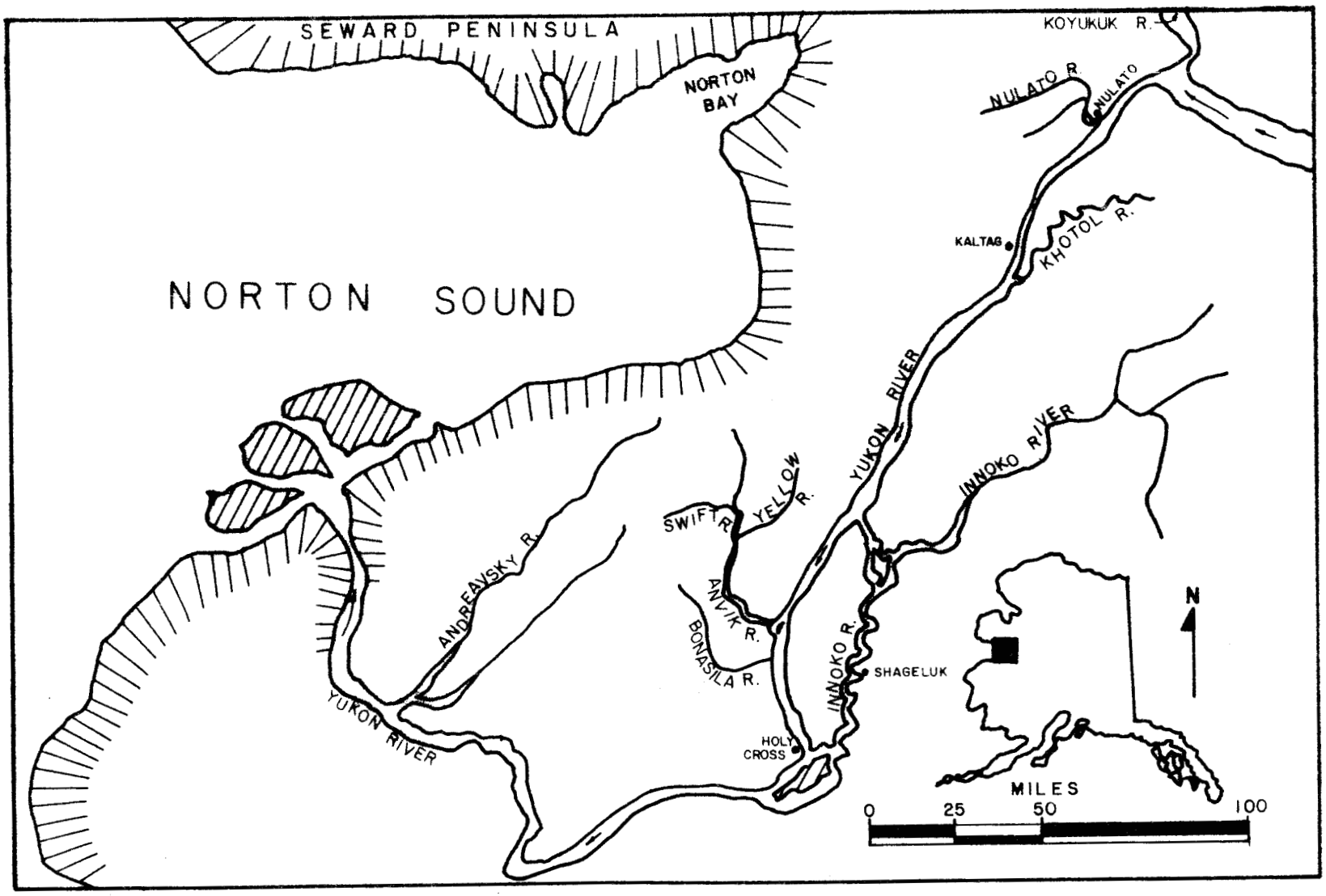

Figure 1. Rivers of the lower Yukon system.

habitat were very low and we found little evidence of rearing grayling. Expansion of the Pilgrim River Study began in 1978 with emphasis on seasonal distribution and abundance of adult and rearing grayling.

The distribution of other fish species, and completion of a general stream survey were also important considerations. Some Pilgrim River age and growth information on grayling has been published (Alt, 1978), and utilization data were published (Alt, 1978; 1979).

TECHNIQUES USED

Lower Yukon River surveys were conducted by riverboat with access from Fairbanks and supply points at Ruby, Anvik, and Nulato. Fish were collected by seine, hook and line, and gill net. Sampling was done in the main river and in adjacent lake-slough areas. The upstream migration of the whitefish species had already occurred and they were found only in lakes and sloughs. Scales were collected for aging from all species except char; otoliths were used to age char. Opercle bones were also collected from pike to assist in aging, but they were not reliable and were discarded. Gill rakers and pyloric caeca were collected and counted in the laboratory. A binocular microscope was used for counting gill rakers. Lower limb counts included the raker in the angle of the arch. Information on fish utilization, distribution, and abundance, as well as insight into the types of streams to be encountered was obtained through conversation with local residents and guides.

FINDINGS

Resource Investigations of Lower Yukon River Drainages

Nulato River:

The lower 5 mi of the Nulato River was surveyed on June 26 and 27. The water was high from recent rain, but was quite clear. The Nulato River begins in the mountains dividing the Unalakleet and Shaktolik River drainages entering Norton Bay and the drainages flowing into the Yukon River. The drainage is 826 mi^2. The South Fork Nulato River has a drainage equal in area to the main fork Nulato River. Both are swift flowing streams with gravel and rock bottoms from the headwaters to the mouth. Stream width at the mouth is 250 ft and the deepest part of the channel was 4.5 ft deep. The stream mouth had a gravel bottom composed of 10% fine sand and gravel, 30% medium gravel, 50% over 1 in diameter, and 10% rock. Gravel composition 5 mi upstream included a higher percentage of larger gravel and rock. The section surveyed contained numerous sloughs, many of which had a gravel bottom overlain with silt. Three gill nets were set in the lower one-half mi of the Nulato River and 14 humpback whitefish, 2 round whitefish, 27 chum salmon, 1 grayling, 2 Arctic char, 3 northern pike, and 2 longnose suckers were captured. Water temperature was 45°F. Local residents mentioned that occasionally sheefish are taken at the mouth of the Nulato River. The Nulato River is an important sport fishing stream for Nulato residents and 12 fishermen took 12 Arctic char, 4 humpback whitefish, and 1 longnose sucker in 20 hours of fishing. They indicated that char are much

more abundant further upstream and are the most important sport species. Little subsistence fishing is done on the Nulato River. The Division of Commercial Fisheries enumerated 500 king salmon and 72,000 chum salmon in the Nulato River (5 year average 1974-78).

Travel upstream in the Nulato River by propeller driven boat is difficult except during high water, thus sport fishing pressure is light on the entire river except the lower one-half mile.

Khotol River:

The Khotol River (locally called "Kaiyuh Slough") drains 900 mi^2 of mainly swampy country on the eastern side of the Yukon River east of Kaltag and Nulato. The Khotol's major tributaries; Yukon, North, Eddy Camp, and Bonanza Creeks, drain the northwestern slopes of the Kaiyuh Mountains. Only the lower 3.5 mi were surveyed. The stream is 360 ft wide, with current speed less than 0.6 mph and has a mud bottom. Water temperature on June 17 was 56°F. Nets were set at the mouth and 2.4 mi upstream, but only 4 sheefish and 3 northern pike were captured. Kaltag residents mentioned that large numbers of sheefish and whitefish migrate up the Khotol River in spring, but left in the fall. This would indicate that the Khotol is an important summer feeding area for these species. Whitefish were probably feeding further upstream and consequently were not captured in gill nets. The Khotol also contains numerous pike which provide a light subsistence and recreational harvest for Kaltag residents.

Anvik River:

The Anvik River rises in the hills south of the Unalakleet River tributaries, the Chiroskey and Old Woman Rivers, and 24 mi from the ocean at Norton Sound. It flows due south for 160 mi and joins the Yukon River at the village of Anvik. The Anvik drainage is 1,700 mi^2. The lower 100 mi of river were surveyed by boat from June 18 to 22. The river was higher than normal during the beginning of the survey, but had dropped considerably by June 22. The portion surveyed was divided into four sections based on changes in stream characteristics. The lower Anvik is important for subsistence and recreational fishing activities; while a small guiding operation exists on the upper river. It is one of the most important chum salmon streams in the Yukon River drainage and the Commercial Fisheries Division of ADF&G report the 1974-78 average escapement at 393,000 fish. About 1,000 chinook salmon also spawn in the river.

Section I comprised the lower 10 mi, the area from the Yukon River to the first major areas of gravel bars. The current in this area was slow 1-2 mph, the channel is wide (360-600 ft) with a depth of 4.5-13.0 ft, and the water temperature was 48°F. Numerous sloughs and channels are present in this section. Bank vegetation consisted mainly of willows. Bottom composition was mainly sand and silt, but some fine gravel overlain with silt was present. Chum salmon were entering the river in large numbers and considerable commerical fishing activity was occurring at the mouth. Subsistence fishing also occurs in the lower 1.8 mi. Gill nets set in the main river and in sloughs of the lower river took chum salmon, sheefish, pike, and humpback whitefish. Seining off of a gravel bar at the extreme upper reaches of Section I took 20 burbot young-of-the-year, 14 chum salmon

fry, 14 round whitefish, 10 grayling, and 3 slimy sculpins. Local residents sport fish for pike, sheefish, and salmon in this section.

Section II consists of 60 mi of moderately swift (2 to 4 mph) meadering unbraided river. The Anvik River in this section still has cut banks. Gravel bars are interspersed with mud and sand bars in the lower reaches of this section with gravel bars more common in the upper section. The river is still quite wide (270-320 ft) and deep and, with the slightly turbid water, the bottom was not visible during the survey. Gravel increased in size from mainly fine sand and gravel in the lower reaches of this section to fine and medium gravel and rocks in the upper section. Numerous sloughs were present, providing excellent habitat for pike. A few grayling were present in the upper part of this section. Shore vegetation included willow, alder, aspen, birch and spruce. Two small tributaries; Goblet and Theodore Creeks, enter the Anvik in Section II. The Anvik comes close to a range of hills below Goblet Creek. No gill nets were set in this section, but northern pike and grayling were caught on hook and line. A number of abandoned cabins are present along this stretch of the river. Water temperature was 47°F.

Section III consists of 24 mi, where the Anvik River leaves the flatter country and flows into the hills. It has little or no cut bank and is considerably straighter than Section II. The current speeds up and the bottom was visible during our survey. Stream width varies from 240-320 ft and shore vegetation remains as in Section II except tall cottonwood trees become more abundant. Bottom composition changes toward larger size gravels, and over 60% by volume of gravels are over 2 in in diameter. The stream is more braided and sloughs, although less abundant than in Section II, occur with an average frequency of one every 2.4 mi. Arctic char were first encountered in the lower end of this section where they were captured on hook and line. Char and grayling were abundant in many of the sloughs and the main river of this section. This section contained the highest concentration of grayling and char of the entire river. They were most abundant in slough areas, but, with the onset of chum salmon spawning in the main river, would probably soon move there. Some of the larger sloughs contained pike, whitefish, and blackfish, with round, humpback, and broad whitefish, and least cisco being taken in the area 5.6 mi below Yellow River and 0.6 mi up Yellow River in a slough. Chum salmon were already present in the upper Anvik, but had not begun to spawn. This is a major chum spawning area. In years of normal water condition travel with a propeller driven boat on this section would be difficult, especially the area below Yellow River. Two permanent dwellings are present in this area and the resident living 4.5 mi above Yellow River takes out a few sport fishing clients each year. A Fish and Game counting tower and sonar site are also present. Yellow River is a major tributary and has a gravel bottom over its entire course. Few grayling or char were observed in its lower 1.8 mi. Yellow River water was more turbid than Anvik River water. Water temperature was 46°F. Another tributary stream of this section, Beaver Creek, was not surveyed. Residents mentioned that it contains some char and grayling.

Section IV consists of the 5 mi below Swift River, the uppermost part of the river reached during the survey. It is relatively straight, swift, and

the bottom is composed of rocks, boulders and bedrock. There are no sloughs or side channels and fishery habitat is poor. No grayling or char were taken on hook and line and none were observed. Small gill nets set overnight took only round whitefish. The stream is still 190-240 ft wide, but is very shallow and boat travel, except with a jet equipped motor, would be impossible during normal years. Some chum salmon evidently spawn in this area, but none were present on June 22. Water temperature was 46°F.

Bonasila River:

The Bonasila River is approximately 78 mi long and has a drainage of 1,200 mi^2. It rises in the low mountains to the west of the Anvik River tributary (Beaver Creek) and to the east of the Andreafsky River drainage. The Bonasila flows south until it joins the Stuyahok River, then flows due east to enter the Yukon River approximately 11.5 mi downstream from Anvik. A major tributary, the Stuyahok River, drains the north slope of the Ilivit Mountains and flows north to join the Bonasila River. Only the lower 1.8 mi were surveyed on June 23. The Bonasila in the lower reaches is a wide deep, slow moving, meadering stream with a mud and silt bottom. The water is dark colored. Bank vegetation consists of grass, willows, alders and birch. Gill nets set at the mouth and in the lower 1.2 mi took chum salmon, humpback whitefish, northern pike, longnose suckers, and troutperch. Sheefish were observed feeding, but none were caught. Chinook and coho salmon as well as broad and round whitefish and least cisco and burbot and grayling are probably also present. The Bonasila River represents the furthermost downstream capture of troutperch in the Yukon River system in Alaska, after having reached the upper Yukon River in Alaska about 1961. Anvik residents mentioned that sheefish are present in the Bonasila River up to 40 Mile. Evidently this is the beginning of a gravel substrate. They did not indicate if sheefish spawn in the Bonasila. They also indicated that char are not present in the upper Bonasila. A run of chum salmon was entering the Bonasila at the time of the survey. Salmon escapement counts have not been made in the Bonasila River. The Bonasila receives light subsistence and recreational fishing pressure, mainly from local residents.

Innoko River:

The lower Innoko River from Holikachuk Slough to the mouth at Railroad City was surveyed from June 23 to 26. The river was high and turbid because of recent rain.

Part of the Innoko discharge enters the Yukon via Paimiut Slough 11 mi up from Red Wing Slough, part enters Innoko Slough 3.8 mi up from Red Wing Slough and the remaining discharge enters the Yukon through Red Wing Slough. A small amount of silty Yukon River water enters the Innoko through Shageluk and Holikachuk sloughs. The river is 690-1,000 ft wide in the section surveyed and from 20 to 50 ft deep. The stream is slow moving, with a current speed of less than 2 mph. The bottom is silt and sand-covered in the entire area surveyed. Bank vegetation is composed of willow, alder, birch, aspen and spruce. The section of the Innoko surveyed contains numerous lakes and sloughs which provide spawning areas for pike, as well as feeding areas for pike and the various whitefish species.

Chum and chinook salmon were migrating upstream at the time of the survey and approximately 30 chinook salmon and 350 chum salmon were hanging to dry at Shageluk. Sheefish were also migrating upstream, but in lesser numbers than during the spring upstream migration, according to local residents. Subsistence fishermen were catching about one per day in their salmon nets near Shageluk. Gill nets were set in the main Innoko River near the mouth and near Holikachuk and in lakes near Shageluk and Holikachuk. Nets set in the main river took only salmon, sheefish, and pike, while those set in lakes took humpback and broad whitefish, and pike. The whitefish had already migrated up into lake and slough areas for summer feeding and were not available in the river. Large numbers of whitefish enter Shageluk Lake in the spring and leave in the fall and Shageluk residents subsistence dip net during this time. According to Shageluk residents the same situation holds true for lakes throughout the Innoko River drainage. Three nets set in a 12-ft-deep clear water lake off the Innoko River near Shageluk took six pike and 10 humpback whitefish. All humpback whitefish were taken in a net set on the bottom, while the two surface nets captured only northern pike. This indicates that whitefish were feeding on the bottom. Two nets set overnight in a slough off the Innoko River at Holikachuk took 12 humpback whitefish, 4 broad whitefish, 1 least cisco, and 4 northern pike. Sheefish were observed jumping in various areas in the lower Innoko, especially near the mouth of Shageluk Slough. The sheefish were feeding heavily on a downstream migration of young-of-the-year whitefish (mainly humpback whitefish) and resident northern pike fingerlings. Sheefish could easily be caught on hook and line. Water temperatures in the main Innoko and in sloughs and lakes of the lower Innoko ranged from 56 to 58°F.

There is no commercial fishery and presently no sport fishery operating in the lower Innoko River, but residents of Shageluk and Grayling (Yukon River) take chinook and chum salmon, whitefish, pike, and sheefish for subsistence.

Biological Data on Fishes of Lower Yukon River Area (Holy Cross to Nulato)

This section of the Yukon River and its tributaries contain 20 different species of freshwater fish. In addition to the five salmon species; sheefish, humpback, broad, and round whitefish, least and Bering cisco, Arctic char, burbot, longnose sucker, grayling, pike, burbot, blackfish, trout-perch and slimy sculpin are present.

Of these, the salmon, sheefish, all whitefish except the round whitefish, and possibly blackfish and burbot migrate through the lower Yukon River to enter streams in the study area or streams further up the Yukon. Certain populations may reside both in a tributary stream and in the Yukon River adjacent to the tributary stream. This is probably a more common occurrence during winter months.

The most commonly encountered fish during the survey of the rivers between Nulato and Holy Cross were chum salmon, pike, grayling, sheefish, Arctic char and three whitefish species (round, humpback and broad). Salmon are the most important commercial and subsistence species, with whitefish, sheefish, char, grayling and pike having recreational and subsistence value.

Biological data on salmon are collected by the Division of Commercial Fisheries and are not presented in this report.

Grayling:

Anvik River. Grayling were first encountered in shallow water 11 mi up the Anvik River. The first gravel bars were found in this area and 10 grayling from 75-234 mm (Age I to III) were taken by seine. No larger grayling were taken or observed. They are probably distributed throughout the system above this point, but the next sampling was done at Mile 70. Grayling of various sizes were taken by hook and line and gill net in the area of the Anvik River from Mile 70 to Mile 95. This was the area of best grayling habitat with heaviest concentration observed in sloughs and side channels, but also in slower water areas of the main river. Local residents mentioned that many of the grayling present in sloughs would soon move into the main river to feed on salmon eggs. The section of the Anvik from Mile 90 to Mile 100 (up to Swift River) was a swift, single channel with no sloughs or side channels and few grayling were observed or captured.

Grayling captured ranged in length from 75-400 mm and in age from Age I to Age III (Table 2). Maturity is reached at about 300 mm, which corresponds to Age V. All fish under Age V were immature and all fish over Age V were mature. A 275 mm Age V fish was immature. Young-of-the-year grayling were not observed, however they may not yet have hatched at time of the survey. Most of the adults captured showed evidence of recent spawning.

Grayling were feeding mainly on caddis fly nymphs (Ephemeroptera), but stone fly larvae (Plecoptera), Diptera larvae, snails, cladocerans and clams were also eaten.

Growth of Anvik River fish is similar to growth of grayling from the Aniak River (Lower Kuskokwim) (Alt, 1977) and Goodpaster River (Interior Alaska) (Tack, 1974).

Other Streams. Only one grayling (354 mm fork length Age VII) was taken in the lower Nulato River. Based on habitat encountered in the lower 5 mi, grayling could be expected to occur throughout the drainage.

Grayling were not captured in the sections of the Innoko, Bonasila, and Khotol rivers surveyed, but they are probably present in headwater areas.

Humpback Whitefish:

Humpback whitefish are one of the most abundant resident species in the lower reaches of rivers in the study area. Migration patterns of humpback whitefish in the lower and middle Yukon River are not fully understood, but both anadromous (overwinter in lower Yukon River) and river resident populations probably exist. After breakup there is a noticable upstream migration in the main Yukon River and tributary rivers. Local residents report that gill net catches fall off sharply within 10 days of last ice movement. This suggests overwintering over long reaches of the Yukon River or overwintering in the lower Yukon with some under-ice upstream movement. At the time of our survey (June 15-27), most whitefish had moved upstream in tributary rivers to summer feeding areas in lakes and sloughs. In the Anvik and Innoko Rivers they were captured only in these areas. The Nulato River contained humpback whitefish in the junction of clear and silty water of the Yukon River, but also 100 yards upstream over the swift gravel bottom where they were captured with hook and line.

Table 2. Age-length relationship for Arctic grayling from streams of middle and lower Yukon River. Fork length in mm.

Location		Age At Capture							
		I	II	III	IV	V	VI	VII	VIII
Nulato River	$\bar{x}$							345	
	n							1	
	Range							345	
Anvik River	$\bar{x}$	82	157	222	256	301	...	383	389
	n	4	4	5	1	4	...	2	5
	Range	75-94	135-193	216-256	256	275-310	...	370-395	378-400

In the Anvik River, humpback whitefish were found only in sloughs near Mile 80. Three nets set for 2 nights in sloughs near Mile 80 and 1/2 mi up Yellow River took four humpback whitefish from 39-48 cm fork length. Fish were Age VII to XII and all were mature (three females were nonconsecutive spawners). The humpback whitefish inhabiting the upper Anvik River probably spawn in that section of the river.

Fourteen humpback whitefish were taken by gill net in the lower Nulato River and three by hook and line. Nulato fish ranged in length from 392-475 mm and in age from VIII to XI (seven fish) (Table 3). Other fish were of the same size range and were released. Nulato River humpback whitefish ranged in weight from 700 to 1,350 g ($\bar{x}$=982). All were mature.

Eighteen humpback whitefish sampled from Holikachuk Lake and Innoko Lake #1 ranged in length from 215-508 mm and in age from II to XI. Only four fish less than 400 mm fork length were captured. All fish Age VI and over were mature. The nine fish over Age VII included seven males and two females, a sex ratio typical of many humpback whitefish population in Alaska. Snails and clams were the most important food items, but caddis flies, Diptera larvae and cladocerans were also eaten.

Based on the limited sample it appears that Innoko River fish grow faster than Anvik or Nulato fish. Growth of fish in the study area is similar to growth of humpback whitefish from areas of the Yukon River drainage in the interior of Alaska (Alt, 1979).

Arctic Char:

Distribution. The Arctic char is found only in a number of relatively swift flowing streams entering the Yukon River from the North. The limit of distribution is from Ruby to Andreafsky and includes the Melozitna, Nulato, Anvik and Anadreafsky Rivers. They may be present in a few more streams, but occurrence has not been documented. Dwarf stream resident char have been captured further up the Yukon River (Minook Creek, Rampart) and in the upper Tanana River drainage; these are considered Dolly Varden. The char found in streams of the lower Yukon are probably not anadromous, although personnel from the Division of Commercial Fisheries and local residents occasionally catch a char in the river. In the Nulato River, char are distributed from the mouth upstream. In the Anvik they were first encountered 70 mi upstream in June. In the Melozitna and Andreafsky they are reported about 10 mi upstream.

They were most widely distributed in pool and slough areas during the survey but reportedly move out into riffle areas during salmon spawning to feed on eggs. Three different color combinations of char were observed in the Anvik River. The silvery phase was most common and was composed of immature fish and some males and females that would spawn in the current season. These fish were generally not as silvery as anadromous sea-run char, but had pale pink spots with occasionally a bit of pink or red on ventral fins. The dark colored phase included some nonconsecutive spawners and prespawners. Generally body coloration was darker than the silver phase, with spots pale to bright pink, and with leading edges of fins white to dark pink. The color phase in June was comprised of fish that had

Table 5. Age-length relationships for humpback whitefish from streams of the lower Yukon River. Fork length in mm.

Location		Age At Capture											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Nulato River	$\bar{x}$	...	...	...	...	...	...	...	422	438	...	454	...
n=7	n	...	...	...	...	...	...	...	2	3	...	2	...
	Range	...	...	...	...	...	...	...	392-452	409-469	...	433-475	...
Anvik River	$\bar{x}$	...	...	...	...	...	395	...	...	402	...	...	481
n=4	n	...	...	...	...	...	1	...	...	2	...	...	1
	Range	...	...	...	...	...	395	...	...	388-415	...	...	481
Innoko River	$\bar{x}$	...	235	...	...	312	468	411	...	452	487	500	...
n=18	n	...	2	...	...	1	1	5	...	6	2	1	...
	Range	...	215-256	...	...	312	468	384-431	...	400-500	450-508	500	...

spawned the previous fall. They have dark red or pink spots, colored fins and males still have a kype. The process of coloring up for spawners of the current year does not begin until later in the summer. Some local residents claim that the silvery phase is anadromous. Present evidence does not appear to support this hypothesis.

Taxonomic Notes. Gill raker counts for char from the Anvik River ranged from 11-14 ($\bar{x}$=12.8) on the lower limb and 20-24 total counts ($\bar{x}$=22.0). (Table 4). Nulato River char had almost identical counts. Pyloric caeca counts ranged from 20-35 ($\bar{x}$=27) for Aniak River char and 24-34 ($\bar{x}$=29.3) for Nulato fish. The Arctic char taxonomic picture is quite clouded, with researchers and managers unsure as to what char is an Arctic char and what is a Dolly Varden, especially in the Bristol Bay to North Slope area (McPhail and Lindsey 1970; Scott and Crossman 1971; and McCart et al. 1972).

Gill raker counts of Nulato and Anvik River char are somewhat intermediate between literature counts for Arctic char and Dolly Varden. They are probably closer to the Arctic char as described by McPhail and Lindsey (1970), who indicate that Arctic char have higher gill raker counts on the lower limb (12-19) than Dolly Varden (8-14). McPhail and Lindsey list the char from the lower Yukon River as Arctic char. Gill raker counts of the Anvik and Nulato Rivers are similar to counts for Arctic char from the Kuskokwim River (Alt 1977), the Colville River (Winslow and Roguski 1970), and both dwarf resident and anadromous char from the Sagavanirktok River (McCart, et al 1972). Review of the data presented by Alt (1977) showed that the gill raker in the angle of the arch was not included in the lower limb count, and thus the comparative data in Table 4 were adjusted to include the raker on the angle of the arch. Gill raker counts from lakes are slightly higher than from streams.

Pyloric caeca counts for Anvik River char were 20-35 ($\bar{x}$=29.3) and for Nulato River char were 24-34 ($\bar{x}$=29.3) (Table 5). Both are slightly lower than counts for Arctic char from the Sagavanirktok River (McCart et al 1972). Because of the wide range of counts given for both Arctic char and Dolly Varden my samples could fit in with either species.

Age and Growth. Twenty-three char from the Anvik River ranged from 370-555 mm fork length and Age VI to XI (Table 6). Four Nulato River char were 101-395 mm and Age II to VII. One Nulato char found in a pike stomach was the only rearing char found in either system. They are undoubtedly present in the Anvik River, but extensive sampling failed to reveal their presence. Anvik char weighed 350-1,300 g ($\bar{x}$=630 g). A 790 g char was captured on the Melozitna River by an angler in 1979, indicating these fish reach the same size as Anvik fish. By contrast, dwarf char present in the Tanana and upper Yukon River drainages seldom exceed 100 grams.

Growth of Anvik River fish is slightly faster than that of river resident fish from the Aniak River (Kuskokwim system), but slower than growth of the anadromous fish from the Goodnews River (Alt 1977).

Maturity. Twenty-two of the 23 Anvik River char were mature; although three females were judged nonconsecutive spawners, as they contained re-

Table 4. Gill raker counts for char from Anvik and Nulato rivers (present study) with comparative data from other Alaska waters.

Location	No.	Gill Rakers on Lower Limb		Total Count	
		Mean	Range	Mean	Range
Nulato River	5	12.8	11-14	22.0	20-24
Anvik River	15	12.6	11-14	21.9	20-24
Aniak River*	13	12.5	11-13	21.5	19-23
Kanektok River*	10	13.0	12-14	21.9	20-24
Kisarolik Lake*	20	14.9	13-16	24.9	23-28
Canyon Lake*	13	14.5	13-16	24.5	22-27
Sagavanirktok River**	52			22.4	19-27
Colville River*** (Northern Alaska)			11-13	22.3	

* Alt 1977
** McCart et al. 1972
*** Winslow and Roguski 1970

Table 5. Pyloric caeca counts for char from the Nulato and Anvik rivers with counts from Colville River included for comparison.

Drainage	No.	Number of Pyloric Caeca Mean	Range
Nulato River	4	29.3	24-34
Anvik River	14	27.0	20-35
Colville River*		31.7	25-42
Sagavanirktok River**			23-39

* Winslow and Roguski 1970
** McCart et al. 1972

Table 6. Age-length relationships for char from Anvik and Nulato rivers. Fork length in mm.

Location		Age At Capture										
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Nulato River	$\bar{x}$	...	101	...	...	354	394	395	...	...	...	...
n=4	n	...	1	...	...	1	1	1	...	...	...	...
	Range	...	101	...	...	354	394	395	...	...	...	...
Anvik River	$\bar{x}$	...	...	...	...	...	386	431	456	450	490	540
n=23	n	...	...	...	...	...	3	10	3	3	2	2
	Range	...	...	...	...	...	370-400	395-450	420-500	430-470	460-520	525-555

tained eggs and remaining eggs were 1.4 mm in diameter or less. The only immature fish captured was an Age IV, 400 mm specimen. Females that were judged potential spawners contained eggs ranging in size from 2.2 to 2.7 mm in late June. Some Anvik River anglers had reported char spawning in July, but egg diameter in June suggests these char probably spawn in September and October.

Stomach Analysis. Half of the 22 Anvik River char had empty stomachs. Diptera larvae were found in eight stomachs, unidentified eggs in one stomach and mayfly (Ephomeroptera larvae) in two stomachs.

Northern Pike:

Northern pike were distributed throughout the study area and were captured in mainstem rivers, lakes and sloughs. In the Anvik River they were most abundant in sloughs from 29 to 36 miles upstream, but were also found in the lower Yellow River and sloughs located 78 mi upstream. Pike are probably more abundant in slower moving streams such as the Khotol and Andreafsky, but based on our survey, it appeared that presence of lake and slough environment was a more important factor. In the main Innoko River, for example, no pike were captured, but they were numerous in side channels, sloughs and lakes.

During our survey pike had completed spawning and were on summer feeding grounds. There is probably a late fall movement into mainstem rivers and possibly the main Yukon River for overwintering.

Age and Growth. Pike captured ranged from 30-1,050 mm in length and in age from Age 0 to Age XIV (Table 7). Samples were small from all rivers except the Anvik, from which there were 18 fish taken. However, a sufficient sample of young pike was captured to give an idea of growth of pike from lower Yukon River tributaries during their first 4 years of life. A 30-mm pike captured on June 20 had not yet formed scales. Age I fish were 77 mm fork length, Age II fish were 165 mm, Age III fish were 275 mm, while Age IV fish were 359 mm. This indicates slow growth to Age 1, but then about 100 mm per year for the next 3 years. The small sample of older age pike make comparison of growth difficult, but in general growth of pike from the five rivers is similar. The oldest pike captured was Age XIX (105 cm 8.4 kg) or 42 in and 18.5 lb. No pike over 20 pounds were captured, although Kaltag residents mentioned that pike of that size and larger were present in the Khotol River. By contrast, during a two year study of lower Kuskokwim River tributaries, only one pike larger than 724 mm was taken. Growth of Kuskokwim River and Yukon River pike is similar. (The largest pike are probably present in the Innoko and Khotol river drainages.)

Maturity. All pike captured over Age V (except one Age VI female) were mature. Since few pike from Age Classes IV, V, and VI were captured it is inappropriate to speculate further on age at maturity.

Utilization. Pike are lightly utilized by recreational and subsistence fishermen in the Anvik, Khotol, Bonasila and Innoko Rivers.

Table 7. Age-length relationship for northern pike from the lower Yukon River tributaries. A single pike from the Khotol River was 1,050 mm and Age XIX. Fork length in mm.

Location		Age At Capture															
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
Nulato River	$\bar{x}$	...	...	...	...	...	...	...	538	...	...	...	...	...	...	742	...
n=2	n	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1	...
	Range	...	...	...	...	...	...	...	538	...	...	...	...	...	...	742	...
Anvik River*	$\bar{x}$	...	165	275	359	...	492	...	545	600	...	738	...	725	...	...	750
n=17	n	...	2	2	3		3		3	1		1		1			1
	Range	...	159-172	250-300	359-388	...	463-513	...	510-579	600	...	738	...	725	...	...	750
Bonasila River	$\bar{x}$	...	...	...	...	...	...	...	...	...	600	...	...	...	...	...	893
n=3	n	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	2
	Range	...	...	...	...	...	...	...	...	...	600	...	...	...	...	...	860-925
Innoko River	$\bar{x}$	77	...	...	...	410	447	...	...	574	637	...	725	...	...	...	...
n=12	n	4	...	...	...	1	2	...	...	3	1	...	1	...	...	...	...
	Range	75-79	...	...	...	410	450-544	...	...	512-637	637	...	725	...	...	...	...

* Young-of-the-year pike captured June 20, had formed no scales, fork length equals 30 mm.

Sheefish:

Sheefish are present in low abundance in the lower Bonasila, Anvik, and Khotol Rivers as part of the lower Yukon River anadromous population. The species is present in large numbers in the Innoko River system. It is not known if the Innoko sheefish are also part of the anadromous population or if they are a separate population. Spawning grounds are located in the upper Innoko River. A more detailed life history account of Innoko River sheefish is presented in the D-J Report Life History Investigations of Sheefish and Whitefish in Alaska (Alt, 1980).

Pilgrim River Study

The Pilgrim (Kruzgamepa) River originates at the outlet of Salmon Lake at 65°15'N lat. and 184°55'W long. and flows west-southwest for 71 miles before entering the Kuzitrin River at New Igloo at 65°9'N lat. and 165°10'W long. The Kuzitrin then enters Imuruk Basin. The Pilgrim River drainage emcompasses approximatley 368 sq. mi. The Grand Central River which flows into Salmon Lake and thence to the Pilgrim River has an additional drainage of 50 sq. mi. The Pilgrim River drains the northeast side of the Kigluaik Mountains. The stream drops 400 ft over its length, nearly all of it in the upper 56 mi. Water is generally clear, as little soil is present along the banks of the upper reaches of the river. The Pilgrim River system is an important salmon spawning stream, although the sockeye salmon spawn in the Grand Central River. All five species of salmon enter the river but no information on numbers is available. In 1979 1,500 red salmon spawned in Salmon Lake and tributaries. The Pilgrim River is accessable by road at the Salmon Lake outlet, by unimproved road at points along the upper part of the river, and at the Kougarok Road bridge. Access to the river below the bridge is by jet equipped boat. The river was surveyed in July of 1978 and September of 1979 using boat and raft. The river was divided into three sections.

Section I:

Section I extends from 1 mile above Pilgrim Hot Springs to the mouth, a distance of approximately 30 mi. The bottom is composed of mud and silt in the lower reaches of this section, with sand and some small gravel in the area near Pilgrim Hot Springs. The river is contained in a definite channel, and the current is slow, especially in the lower end. Stream width is 210-270 ft and depth varies from 3-10 ft. The Pilgrim River in the lower reaches is covered with a thick mat of submergent vegetation. Bank vegetation consists of willows in the upper reaches and grasses and sedges in the lower river. Numerous lakes and sloughs are present in this section and provide habitat for pike and whitefish. Many sloughs were very shallow in September, so pike probably would be forced to overwinter in the main Pilgrim River. During the July survey when water levels were higher, pike were captured over extensive slough areas. Access to this section is by boat from the bridge further upstream or through Imuruk Basin and the Kuzitrin River. Anglers generally travel by jet equipped boat from the bridge to reach the pike fishing areas of Section I. Two net nights of fishing near the mouth of the Pilgrim River took 25 northern pike, 19 broad whitefish, 3 Arctic char, 1 chum salmon, and 1 humpback whitefish. One net was set in the main river and the other in a small lake of the main river.

The net in the main river had more fish, and it appeared that a run of broad whitefish was migrating to upstream spawning grounds. The Arctic char were spent. Northern pike were captured by hook and line in Section I and rearing grayling were observed in the upper reaches of Section I.

Section II:

Section II included the portion of the river downstream from the bridge across the Pilgrim River to 1 mile above Pilgrim Hot Springs, a distance of approximately 15 mi. The stream is 160-200 ft wide and generally shallow with many riffle areas. Section II is considerably braided. Current speed on September 19 was 3.5 mph and flow was 714 cfs. Water was clear and the bottom was visible over most of the course of Section II. Water temperature on September 19 was 43°F. Few sloughs or tributary streams are present in this area. Shore vegetation is sparse and consists mainly of willows. Gravel composition is 5% fine sand and gravel; 30% 1-2 in, and 60% over 2 1/2 in. Section II is important for spawning Arctic char, grayling, and chum, pink and coho salmon. This is the most intensively utilized area for recreation, and many Nome area anglers use jet boat access from the Kougarok bridge to fish for grayling, Arctic char and salmon. A number of 3-lb grayling have been captured from this section of the Pilgrim River. Angler interviews in this section during the past 2 years indicate that a few round whitefish are also captured on hook and line.

Section III:

Section III consists of 26 mi of the upper Pilgrim River from the bridge up to its origin at Salmon Lake outlet. Current flow was 2.5 fps (2 mph), average width of the stream was 170 ft and average depth was 1.3 ft. The stream was clear, and the bottom was generally visible. Bottom composition is 20% sand and fine gravel, 60% (2-6 in) and 20% rocks over 6 inches in diameter. The stream has 65% pool areas and 35% riffle areas, with some rapids present and an occasional large boulder in the stream channel. Bank vegetation is mainly willow and tundra grasses.

The river is relatively straight and generally confined to a single channel. This section contains many tributary streams including Star, Crater, Grouse, Big, Iron, Homestake, Sherrett, Golden Gate and Lucky Dog Creeks. Crater and Iron Creeks are the largest and both are swift flowing streams with bottoms of large gravel and rock; both provide spawning habitat for grayling and Arctic char. Limited gold mining occurs in Iron Creek, but no visible pollution was observed during the survey of this section July 5, 1978. Few fish were observed during the float and only eight grayling and two Arctic char were captured with hook and line. The char were taken at the mouth of Iron Creek and both were prespawners. Rearing grayling and char were taken in Crater and Iron Creeks. Chum salmon were spawning in the lower reaches of Section III but no migrating sockeye salmon were seen. They are known to spawn in the Salmon Lake drainage. Section III receives less fishing pressure than Section II, mainly because of fewer fish present. Access by road is available at the Salmon Lake outlet, and Kougarok Bridge. At various locations between, short access roads lead to the Pilgrim River.

Fishes of the Pilgrim River

The Pilgrim River system has great species diversity with 14 species of fish. Included are five species of salmon, Arctic char, least cisco, round whitefish, broad whitefish, humpback whitefish, grayling, pike, blackfish and sculpin. Suckers are present in the neighboring Kuzitrin River, but have not been captured in the Pilgrim River. Pink and chum salmon are the most abundant fish in the river, followed by pike and grayling, then sockeye salmon, coho salmon, char and chinook salmon. Broad whitefish appear to be abundant in the lower Pilgrim River and possibly spawn further upstream. Least cisco are present in Salmon Lake and probably the lower Pilgrim River. Recreational fishermen angle primarily for the large grayling, but also for Arctic char, and pink, chum and coho salmon and travel to the lower reaches of the river for northern pike. Heavy subsistence pressure is placed on the five species of salmon as they pass through Grantley Harbor and Tuksuk Channel on their way to the Pilgrim River.

Grayling:

The Pilgrim River study had as its main objectives to determine the status of the grayling population. Preliminary work on the Pilgrim River indicated the presence of large grayling (2-3 lb), but the total number of grayling was quite small. Also few grayling under 300 mm (12 in) were observed or captured. At the same time more and more anglers were traveling by boat downstream from the bridge and capturing grayling by hook and line. The daily bag limit is 15 fish, (3 over 20 in) with a possession limit of 30, and some concerned anglers felt that the trophy size grayling would be removed if the limit remained so liberal. Investigations began in 1977 and included collection of angler use data, and grayling life history data. In 1977 the Pilgrim River was visited during the peak of the summer fishery and 85 anglers were observed. In 1978 during nine visits 40 anglers were counted. During 1977 only two visits were made, both involved in completing the Pilgrim River survey. Local residents said poor summer weather in 1978 and 1979 resulted in lower fishing pressure than 1977. Most fishing pressure is exerted on grayling, chum and pink salmon, and Arctic char. Some pike fishermen go below this point and a few anglers seek Arctic char and grayling in the section above the bridge.

Seasonal Distribution and Abundance. Grayling observations in the Pilgrim River were conducted only during July, August and late September. Grayling were associated with areas of salmon spawning and were found in close proximity to salmon redds where they fed on salmon eggs. During early July grayling were less abundant in salmon spawning areas and those present were found in slough areas or sections of slower moving water (i.e. pools, eddies, cut banks). Grayling had probably moved upstream with the salmon in July. Observations in late September 1979 showed grayling to be only slightly less abundant below the bridge than in early July. Again, since most salmon spawning was complete, grayling were found in slower water feeding on insects. Lower numbers of grayling observed in late September could be due to downstream movements to deeper water near Pilgrim Hot Springs or summer capture by anglers. Both are probably responsible. Some slough areas used by grayling in July were completely dry in late September, thus grayling were more concentrated. It is roughly estimated that 30-40 grayling could be observed per mile of stream in the 15 mi from

the bridge to 1 mi above Pilgrim Hot Springs. Numbers observed were always higher in early July. During a July float trip from the outlet of Salmon Lake to the bridge (approximately 26 mi), only eight grayling were observed. There are obviously more grayling present, but the numbers per mile are less than in the section below the bridge.

Pilgrim River grayling were aged in 1977 and, except for rearing fish, sampled fish ranged in size from 317 to 502 mm and in age from V to X (Alt 1978). Pilgrim River grayling are nearly 100% mature by Age VI. This is a late age at maturity for Alaska grayling. They reach their large size because of a longer life span (3-4 years longer than other Alaskan populations). Their growth rate, while not as rapid as some Interior populations, is faster than North Slope and Kuskokwim River populations.

Large grayling captured subsequent to 1977 were essentially the same size per age as indicated by Alt (1978) except that a larger sample of Age IX fish indicated that true size at this age is closer to 465 mm rather then 502 mm.

Rearing grayling. Considerable time was spent searching for rearing grayling in the Pilgrim River. Some rearing grayling were found in Crater and Iron Creeks, in sloughs and backwaters of Section II below the bridge and the greatest abundance was found in the main Pilgrim River near Pilgrim Hot Springs. Grayling were found in shallow, slow moving water and also in brushy and grassy areas of adjacent sloughs in the vicinity of Pilgrim Hot Springs. Young-of-the-year grayling captured on August 28 were 60-62 mm fork length, Age I grayling captured on July 12, were 74 to 101 mm and one Age II fish was 115 mm on July 12. Rearing grayling of Age III and IV have not been captured except for one Age III fish in 1977.

Thus slower moving water areas of the Pilgrim River and probably of other Seward Peninsula streams are important rearing areas for grayling and probably serve also as overwintering areas for adults.

Grayling Management Implications. While the potential for overexploitation of grayling from the Pilgrim River and other Seward Peninsula streams exists (due to low abundance, late age at maturity and ease of catchability on hook and line), evidence gathered during the 3-year study does not indicate overexploitation. Grayling numbers seem to be about the same from year to year. Furthermore, a lowered limit would probably not significantly reduce the harvest, as few fishermen keep all of the grayling they catch.

Due to the inconclusive results of the grayling study and the apparently low abundance it is recommended that the grayling population from the bridge down to Pilgrim Hot Springs be monitored within 2-3 years and scales collected for aging. This information can be compared with 1977-1978 data to determine if there is a shift in population structure. A more complete study should be initiated when more manpower is available, with emphasis on spawning grounds, rearing areas, food availability, and population estimates utilizing a tagging program.

Northern Pike:

Northern pike are abundant in the lakes, sloughs, and main river in the section of lower Pilgrim River. Few pike were captured in the swifter water section above Pilgrim Hot Springs. They were very abundant in the lake-slough system of Pass Creek, especially during July. This area is probably a prime spawning area. Gill nets were set in the lower mile of the Pilgrim River in late September and 26 pike were captured. All were large; 600 mm was the smallest taken during the late September sampling.

Fifteen northern pike were aged. Fish ranged in length from 340-826 mm and in age from III to XIV (Table 8). Rearing fish were very uncommon and only one fish under Age VII was captured. That pike (340 mm Age III) was the only immature pike taken during the survey. Pike averaged between 0.6 and 9.7 lbs (0.3 and 4.43 kg). Local residents claim that pike over 10 lbs (4.54 kg) and longer than 33 in (825 mm) are occasionally caught by anglers. Fish were feeding mainly on whitefish, and one pike captured on a small lake near the mouth had eaten a 175 mm Arctic char.

The lower Pilgrim River is probably the most important pike angling stream available to Nome area anglers. While the pike seldom exceed 10 lb in weight, they are a welcome addition to the species diversity available to Seward Peninsula anglers and a fish over 8 lbs is considered a "Trophy" by local residents.

Broad Whitefish:

Board whitefish had not been captured or observed in the Pilgrim River prior to test netting in late September near the mouth of the river. They were known to be present in Imuruk Basin and the lower Kuzitin River. Twelve broad whitefish were captured in gill nets set in the lower 1 mi of the Pilgrim River on September 19. All fish captured were in spawning condition. Water temperature was 40°F. These fish could have been part of a spawning migration moving up the Pilgrim River to spawn or could have been milling in the lower Pilgrim River before migrating up the Kuzitrin River to spawn. Prespawning broad whitefish were also captured in a lake near the mouth. This fact, as well as not observing broad whitefish further upstream in the Pilgrim River, leads the author to believe that they were coming out of the lake and moving down into the Kuzitrin River. The Kuzitrin has gravel more suitable to spawning needs of whitefish and both humpback and broad whitefish are known to spawn in the Kuzitrin River.

Broad whitefish captured were all in the same size range (434-525 mm) so only five fish were aged. One fish (434 mm) was Age VI, three (413-487 mm) were Age VII, and one fish was Age VIII. Weight ranged from 1,125-1,875 g.

Broad whitefish are used for subsistence by temporary residents of Mary's Igloo and by families netting the Kuzitrin River at the bridge.

Humpback Whitefish:

Humpback whitefish occasionally enter the lower Pilgrim River. None were taken in gill net sampling, but one fish was found in a pike stomach in a lake 1 mi up the Pilgrim River in the area of New Igloo. This 337 mm

Table 8. Length-weight relationships for pike from Pilgrim River, Alaska. Fork length in mm.

	Age At Capture													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
$\bar{x}$	...	...	340	...	...	...	511	520	644	588	656	719	825	826
n	...	...	1	...	...	...	1	1	2	2	2	3	2	1
Range	...	...	340	...	...	...	511	520	600-688	575-600	640-672	675-750	788-862	826

prespawning female probably would have joined the huge spawning population in the upper Kuzitrin River.

Round Whitefish:

Although numerous in Salmon Lake, round whitefish are not abundant in the Pilgrim River. They are distributed throughout the Pilgrim River from Salmon Lake to the Hot Springs, but few were observed or captured.

Growth of round whitefish from Salmon Lake and Pilgrim River was reported by Alt (1979). Pilgrim River fish captured ranged in length from 409-495 mm and in age from VII to XII. The Pilgrim River fish grew considerably faster than Salmon Lake fish.

Arctic Char:

Arctic char are distributed in the Pilgrim River from the lower reaches up to Salmon Lake and its tributaries. They are probably anadromous, although the capture of two prespawning fish near the mouth of Iron Creek in early July suggests that some char remain in the stream for up to 20 months before migrating to the ocean to feed.

Char are most abundant in August and September, and at this time are usually found in areas of salmon spawning. Char generally lay in riffle areas rather than in pool areas as grayling often do.

The most popular sport fishing areas are the mouth of Iron Creek and the 6 mi below the Pilgrim River bridge. Char have never been known to be abundant in the Pilgrim River and probably less than 200 are captured per year. During July surveys of Section III (upper Pilgrim) only two char were observed or captured. More char probably arrive later, as Nome anglers report best success in September.

Only eight char were captured for aging and these fish ranged from 450-627 mm fork length and from Age VI to X (Table 9). In addition a rearing char of 32 mm (Age 0) was captured by seine. Rearing char of Age I to Age V were not located. They may be in tributary streams.

Based on the small sample, it is difficult to compare growth of Pilgrim River fish with other Seward Peninsula streams. At Age IX though, Pilgrim River fish are somewhat faster growing than other Seward Peninsula populations (Alt 1978). The Pilgrim River probably has the largest Arctic char of any stream in the Nome area and two of the eight char captured weighed over 5 lbs (2,270 g). All stomachs were empty.

All char captured were mature, though two were non-consecutive spawners. One female char captured on September 19, 2.4 mi below the bridge had nearly completed spawning and a char captured by gill net at the mouth of the Pilgrim River on September 20 was spent. She had probably spawned further upstream. Water temperature was 42°F.

Table 9. Length-age relationships for Arctic char from Pilgrim River. Fork length in mm.

	Age At Capture				
	VI	VII	VIII	IX	X
$\bar{x}$	450	...	465	536	587
n	1	...	2	4	1
Range	450	...	437-493	475-627	587

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